Functional Class Geodatabase Design

Alaska Department of Transportation and Public Facilities

Final

Report

prepared for

Alaska Department of Transportation & Public Facilities

prepared by

Cambridge Systematics, Inc.

with

HDR Alaska, Inc.

July 2009

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Table of Contents

List of Tables

List of Figures

1.0 Introduction

The Alaska Department of Transportation and Public Facilities (ADOT&PF) is the responsible agency for assigning and updating the federal functional classification of public roads (23 CFR 470.105). ADOT&PF conducted the last statewide functional classification update in 1992-93. Since then, throughout the state, there have been changes in land use, travel patterns, traffic generators, traffic volumes, economic conditions, and urban/rural boundaries. In meeting the requirements of 23 CFR 470.105, ADOT&PF is undertaking a 2007-08 statewide functional classification review and update. This update project will ensure that all public roads are assigned an appropriate federal functional classification and those roads that serve as a collector or arterial route are tracked in ADOT&PF's transportation database, the Highway Analysis System (HAS).

The 2007-08 functional classification update project includes a task to build a prototype Functional Class Personal Geodatabase (hereafter referred to as the FClass GDB). This report aims to document the design and development of the prototype FClass GDB.

1.1 PURPOSE OF THE FCLASS GDB

The FClass GDB intends to serve as a relatively simple interim geo-spatial tool for mapping and analyzing Alaska's statewide collector and arterial road network until ADOT&PF's Enterprise Geodatabase (Enterprise GDB) contains centerline network data for all collector and arterial routes. ADOT&PF's Enterprise GDB integrates HAS data with GPS/Photolog derived centerline network data and unifies data processing, management, maintenance and output in an enterprise environment. Although the Enterprise GDB will be ADOT&PF's primary GIS source for geographic data related to HAS, it does not cover the statewide road network system at this time, which is why ADOT&PF decided to develop a Fclass GDB to support the functional classification effort. The FClass GDB intends to be an interim GIS data repository for a statewide collector and arterial road network (created by merging road line data from various sources) and will contain additional HAS data elements that are most often queried in conjunction with functional classification. Since the initial development of the Fclass GDB, there have been pressing needs for both state owned and local roads for various programs at ADOT&PF. For example, the development of the new generation 511 Traveler Information System requires the inclusion of some local roads; the statewide transportation safety program requires analysis of all accidents on public roads and is not limited to state roads. As the result, ADOT&PF is planning on expanding its enterprise GDB to include additional non-state-owned roads. The network data collected for the Fclass GDB will serve as the starting point for adding non-state data to the enterprise GDB.

1.2 End User Groups

As the FClass GDB is being developed, it will be used by the Functional Classification Update project team (i.e., the ADOT&PF Project Group and the Project Consulting Team) as much as possible to facilitate conducting the functional classification update process. However, the final FClass GDB product will be used for mapping and simple analyses by a wide range of users, including high level managers and planners, operational managers and planners, research staff, and others. FClass GDB end users include Federal, State, and local agency staff and community representatives. Examples of the FClass GDB End Users include:

- FHWA staff who need area specific maps displaying road functional classification, road ownership, and bridges.
- Legislative staff who need area specific maps displaying NHS routes, AHS routes, road functional classification, and road ownership. In addition, they may need to do simple queries and analyses, including centerline mileage queries).
- ADOT&PF Program Development Division staff and Regional/Area Planners who need area specific maps displaying NHS routes, AHS routes, urban areas, road functional classification, road ownership, road surface, and mileposts. In addition, they may need to do simple queries and analyses, including centerline mileage queries by DOT&PF Region, census area, or borough).

2.0 Design the Data Model

In order to design and develop an efficient and effective FClass GDB, it is important to understand and maintain a focus on the FClass GDB requirements. This section will start with a discussion about the basic FClass GDB requirements. These requirements are then translated into business rules, which will be analyzed and prioritized for building the FClass GDB design.

2.1 Requirements

As specified in the project scope, there are several key requirements for the FClass GDB, including the following:

- Organize and store feature classes and data elements (including point, line, area, and raster data)
- Use CDS Route/Milepoint as the linear referencing system
- Use the Enterprise GDB centerlines as the backbone road network

- Use the highest quality road line data (i.e., data acquired from sources other than the Enterprise GDB) for merging with the Enterprise GDB centerlines to create a statewide road network
- Undergo prioritized network stitching and route calibration
- Use the Enterprise GDB design framework as appropriate
- Use dynamic segmentation to compute the map location of events
- Provide data interfaces with the Highway Data Port (HDP) and Highway Analysis System (HAS)
- Provide the capability to display, query, extract, edit, and maintain data elements

2.2 BUSINESS RULES

In order to serve the purpose and meet the requirements identified above, the FClass GDB needs to be designed in compliance with the following rules:

1. ***Geographic extent and scope***: The FClass GDB will include a reference network of all roads classified as collector or arterial, as well as some DOT owned local class roads and other selected local class roads. In addition, the FClass GDB will include "background reference local class roads" that are for reference purposes only.

2. ***Need to identify data source for non-state owned roads.*** The Enterprise GDB stores centerline network with great spatial accuracy, but it only covers state-owned roads. The project needs to identify and investigate network data sources with relatively high accuracy standards for non-state roads, which will be included in the reference network. The source of the data needs to be clearly documented.

3. ***Need to identify data elements that are most often used in conjunction with the FClass data and need to be stored in the FClass GDB***. The most critical line data elements identified by the project team include (1) Functional Classification, (2) Ownership, (3) National Highway System, (4) Alaska Highway System, and (5) Road Surface. Critical point data elements include features such as cross streets, mileposts, bridges, and significant traffic generators. Other important data elements include jurisdictional boundaries and background layers. Appendix A is a preliminary list of data elements that will be built into the FClass GDB.

4. ***Need to use the Enterprise GDB design framework as the basis for the FClass GDB design***. The HAS-GIS Interface project has gone through extensive user needs and requirements analysis to obtain a clear understanding of the business process and the user perspective of the Enterprise GDB. An iterative data modeling process was conducted to design a robust geodatabase that ensures usability, flexibility, and scalability. As an interim geo-spatial tool, the FClass GDB should take

advantage of all the effort that has gone into the Enterprise GDB design and use the Enterprise GDB design where appropriate. The Enterprise GDB centerlines should serve as the backbone of the FClass GDB network. No spatial adjustment should be performed on the Enterprise GDB centerlines.

The FClass GDB can mimic the basic network structure of the Enterprise GDB with TransportLinks, TransportNodes and RouteFeature. Other business data can be stored as event tables or feature classes in the FClass GDB. With a link-node-route transportation feature dataset and route-event data structure, the FClass GDB can be maintained in a similar way as the Enterprise GDB, therefore the customized applications (especially the network maintenance application and the desktop general user application) designed and developed for the Enterprise GDB can be modified to work with the FClass GDB with minimal level of efforts.

5. ***Need to prevent users from misusing the FClass GDB.*** If the FClass GDB is designed as described above, i.e., to mimic the basic network structure of the Enterprise GDB, it is possible that a user may take the FClass network and start mapping their own data onto the network. This is a significant concern to the project team. There is potential for spatial mismatching problems because the reference network for the FClass GDB includes road line data from third parties that has not gone through a rigid quality assurance and quality control process and may be of marginal accuracy. Consequently, the measures on some parts of the reference network may not match with the measures of the DOT data. In order to prevent potential misuse of the FClass GDB and still take advantage of the Enterprise GDB design, a two-tiered approach is suggested:

    - FClass GDB Working version

      Use the structure of Link-Node-Route-Event Tables.

    - Final FClass GDB End User Product

      Convert the reference network and event tables into feature classes. Dynamic segmentation will be used to compute the map location of events stored in the event tables. The route events will then be converted into feature classes that users can display, query, and analyze. Users will not be able to extract the underlying reference network.

6. ***Need to use CDS Route/Milepoint in order to linearly reference HAS and HDP data onto the network***.

    i. Need to establish CDS route correspondence between the non-ADOT&PF network data and HAS.

    ii. Need to get measures on the non-ADOT&PF routes.

iii. Measures need to be calibrated with features with known measures. At a minimum, routes need to be calibrated at a functional class change point; this will ensure that the FClass line event will display correctly (relative to the reference network) when it changes. The extent of calibration can be expanded when needed.

7. ***Need to enable query capabilities***

   i. Provide for mapping routes and events to the reference network

   ii. Provide for displaying milepoint values and attributes for routes and events

   iii. Provide for querying against routes, events, and other feature classes

8. ***Need to provide for an automated methodology to facilitate conducting the FClass update process***.

2.3 DATA MODEL STRUCTURE

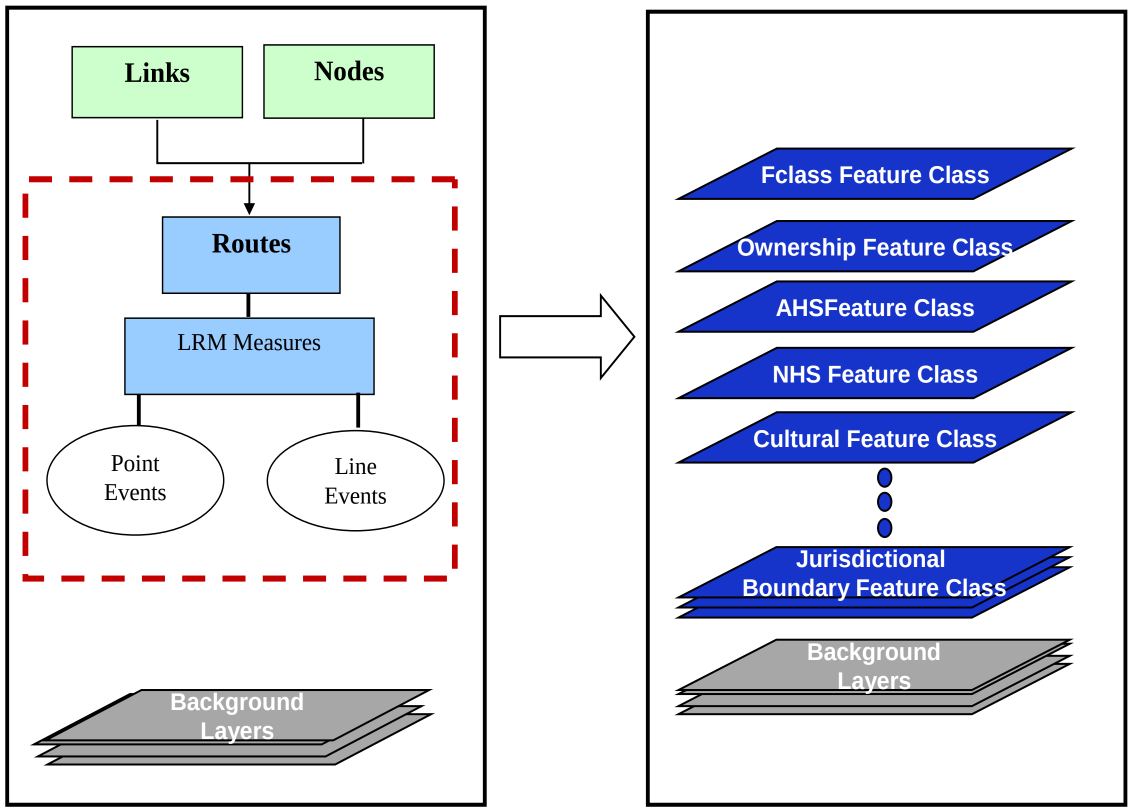
All data objects of the FClass GDB will be organized into five data types that have some similarity of form or function: 1) the network (links and nodes), 2) route, 3) events (point events and linear events), and 4) background features. Table 2.1 shows how these five data types are used to structure transportation-related data and define the relationships between the data objects.

Table 2.1 FClass GDB Data

Layer Type	Network	Route	Point/Line Features	Background Features
Name	Contiguous line work	RouteFeature	Point, line	Various, boundaries, line, raster
Use	Common road geometry for the project user group.	Display, query, and analyze the collector and arterial road network	Display, query, and analyze point and/or line features	Reference information, e.g. hydrography
Source	Multiple agency.	Collector and arterial road network	Feature classes	Mostly ADNR, some federal, local
Represen-tation	Lines	Polyline M	Tables	Vector and raster
Spatial Represen-tation	Can share geometry with routes	Shared geometry with road network	Occur in same spatial frame	Shared spatial frame
Symbology and Annotation	Simple gray lines as background reference	Drawn as thick lines colored by single attribute	Symbolized using standard transportation symbols	Various, following ADOT conventions

Figure 2.1 shows the high level design of the FClass GDB. The working version of the geodatabase will have the same architecture as the Enterprise GDB, which is a route-based linear referencing system. But, the road network and the events will be converted to standalone feature classes for the end user version of the FClass GDB. A feature class is roughly analogous to a shapefile or an individual layer of a coverage. It stores a group of features with a shared geographic extent, spatial reference, attribute table, etc. Each individual point, line, or polygon within a feature class is a separate object within the feature class. The following discussion about the FClass GDB will focus on the data structure for the working version of the database.

Figure 2.1 High-level design of the FClass GDB



1. Reference Network

The reference network provides common underlying transportation network geometry for the FClass GDB users. There are three groups of network features to be stored in the reference network:

- *Group 1*: "Stretched Roads" - these are roads of any classification that have been "stretched" and are in the Enterprise GDB and HAS; they have CDS Route numbers. These are predominantly DOT owned roads and are mostly collectors and arterials. To "stretch" a road means to calibrate the road and associated point and line data in HAS to the newly collected inventory data and road centerline.
- *Group 2*: "Non-Stretched Roads" - these are roads of any classification that have not been "stretched," but they are, or will be, in HAS and have, or will have, CDS Route numbers. Most Group 2 roads are collectors or arterials; only selected local class roads will be included in Group 2. Some of these "non-stretched" roads are in the Enterprise GDB and will be stretched during the upcoming year; they will then be moved to Group 1.

- ***Group 3***: "Reference Local Roads" - these roads are the selected local class roads that will be contained within the FClass GDB for reference purposes only.

The reference network will be stored as a Links layer and a Nodes Layer. Table 2.2 and Table 2.3 show the field definition for each of the network layers. A field called GroupID is added for the links feature class. The value of the GroupID Field corresponds to the data group number:

- 1 = Stretched Roads
- 2 = Non Stretched Roads
- 3= Reference Local Roads

Another field called "DataSource" is added to track where the network data came from.. Refer to Appendix A for Data Source Information.

Table 2.2 Fields in TransportLinks Feature Layer

Field Name	Field Type	Field Size	Allow Null	Default Value	Description	Note	Domain
TransportLinkID	String				Transport Link ID		
CDS_Num	String	8			CDS route number		
Route_Name	String	40			Road name		
Date_f	Date	8			Effective date		
Date_t	Date	8			Termination date		
Date_u	Date	8			Update date		
Begin_Mpt	Double	4.3			Link beginning milepoint		
Begin Node	Integer				Beginning node id		
End_Mpt	Double	4.3			Link ending milepoint		
End_Node	Integer				Ending node id		
Length	Double	4.3			Link length		
GroupID	Integer				Group ID		GroupID
DataSource	String	20			Data source		

Table 2.3 Fields in TransportNodes Feature Layer

Field name	Field Type	Field Size	Allow Null	Default Value	Description	Note	Domain
TransportNodeId	Integer				Node id		
SubtypeField	Integer	1			Node type		
					1 – System Intersection Anchor Points		

			0 – Other Anchor Points	
Date_f	Date	8	Effective date	
Date_t	Date	8	Termination date	
Date_u	Date	8	Update date	
AnchorPointID	Integer	4.3	Anchor point ID	Anchorpoint

2. Route Feature

ADOT&PF identifies each road in HAS with a Coordinated Data System (CDS) Route Number. Each road has a route name (the CDS Route Number) and a route description (the posted road name). The HAS database will contain CDS routes for all DOT&PF owned roads, all non-DOT&PF owned roads classified as collector or arterial, and many non-DOT&PF owned local class roads Any road included in GroupID 2 that currently is not in HAS will be assigned a CDS route number and entered into HAS. In order to map the HAS data on the GroupID 2 roads, it is necessary to assign the CDS route number and build a polyline M route feature with measures, so that events can be referenced using a linear measure on any particular route. The geometry of any CDS route will be coincident with the underlying centerlines, but CDS routes can have important attributes that may not be applicable to the underlying road segments. It is represented in Table 2.4, which shows the fields carried by the CDS route feature layer.

Table 2.4 Fields in Route Feature Layer

Field Name	Field Type	Field Size	Allow Null	Default Value	Description	Note	Domain
CDS_Num	string				CDS Route Number		
MeasuredLength	Double				Measured Length of the route		
LinearReferenceType	String				Linear Reference Type		
LinearReferenceUnits	String				Linear Reference Units		
Route_Name	String				Route Name		
RdType	String		No		Road Type		RdType
Inv_Dir	String				Inventory Direction		Inv_Dir

3. Event Tables

There are two types of events: 1) a line event with a route location that describes a portion of a route, or 2) a point event with a discrete location along a route. Table 2.5 shows the common fields that are shared by both line and point events. The CDS_Num field is a key field that is used to establish the relationship between event records and the routes they belong to.

Table 2.5 Common fields for Point and Line Events

Field Name	Field Type	Field Size	Allow Null	Default Value	Description	Note	Domain
Event_Id	integer				Event ID		
Date_f	Date				Effective date		
Date_t	Date				Termination date		
Date_u	Date				Update date		
CDS_Num	String				CDS Number		
Route_Name	String				Route Name		

A measure location is either one or two values describing the position(s) on the route where the event occurs. A linear route location uses both a from- and a to-measure value to describe a portion of a route, while a point route location uses only a single measure value to describe a discrete location along a route. Table 2.6 lists the additional common fields carried by point events, while Table 2.7 lists the additional common fields carried by line events.

Table 2.6 Additional Common Fields Carried by Point Events

Field Name	Field Type	Field Size	Allow Null	Default Value	Description	Note	Domain
Mpt	Double				Milepoint		
Offset	Double				Offset		

Table 2.7 Additional Common Fields Carried by Line Events

Field Name	Field Type	Field Size	Allow Null	Default Value	Description	Note	Domain
From_mpt	Double				From milepoint		
To_mpt	Double				To milepoint		
Offset	Double				Offset		

Point events include features System Features/Cross Streets, RR Crossings, Mileposts, Bridges/Culverts, and Buildings/Landmarks). Line events include the line features as well as boundary information to be carried as line events:

1. NationalHighwaySystem (National Highway System)

2. AlaskaHighwaySystem (Alaska Highway System)
3. MaintenanceResponsibility (Maintenance Responsibility/Ownership)
4. FunctionalClassification (Functional Classifiation)
5. RoadSurface (Road Surface)
6. TrafficLinks (Traffic Links)
7. HpmsLinks (HPMS Links)
8. NumberOfLanes (Number of Through Lanes)
9. TrafficDirection (Traffic Direction – One or Two Way)
10. NetworkCollInfo (Centerline Network Collection Date)
11. DOTRegion (ADOT&PF Region)
12. CensusArea (Census Area)
13. Borough (Borough)
14. UrbanRural (Urban/Rural Designation)

4. Background Features

The background feature dataset in the FClass GDB includes the classes which share the same spatial reference frame as shown below.

Point Feature Class

(1) Communities

(2) Airports

(3) Ports

Line Feature Class

1. Rivers2mil (1:2,000,000 scale rivers), and
2. Rivers1mil (1:1,000,000 scale rivers).

Polygon Feature Class

1. StateGen (generalized state coastline),
2. State250000 (1:250,000 scale state coastline),
3. Lakes1mil (1:1,000,000 scale lakes),
4. Lakes2mil (1:2,000,000 scale lakes),
5. State63360 (1:63,360 scale state coastline), and
6. SMPO Boundaries.

See Appendix B.3 for fields carried by the Background Feature layers.

3.0 Build the FClass GDB

This section will try to address some of the data storage and processing issues of the FClass GDB. The following processes and workflow are based on discussions with the project group and various memos related to this subject. In summary, six tasks or steps are described below, including:

(1) Acquire road linework from various sources

(2) Compile the road network (GroupID 1, 2, and 3 roads)

(3) Establish CDS route correspondence (GroupID 2 roads)

(4) Build CDS routes (GroupID 2 roads)

(5) Calibrate Route Measures (GroupID 2 roads)

(6) Map events using dynamic segmentation and convert the event layers to feature classes (GroupID 1 and 2 roads)

The end result is a FClass GDB containing a statewide collector and arterial road network (with associated data elements) that provides for simple mapping and analysis.

3.1 Acquire Road Linework

Currently, ADOT&PF does not have centerlines for most roads in GroupID 2 and 3. In order to create the statewide FClass GDB, it is necessary to collect additional network data from various sources outside ADOT&PF. By combining road network data from ADOT&PF with network data from other sources, the FClass GDB will contain centerline representation for all roads in GroupID 1, 2, and 3.

Appendix A lists the data sources investigated by the project team and identifies those sources that are being used for the FClass GDB. A wide variety of road data sources with various levels of data quality and structure were used to build a starting "universe of roads" dataset. The project team reviewed the data on a community by community basis and selected the data source that had the best geometric quality. The network geometry was checked and cleaned when data quality was in question. On community level network data, the most suitable aerial imagery was used from a variety of sources. If digital GIS representation of road data was not available for some communities, the community road data was digitized by tracing aerial images. USGS Elevation Hillshade (1:1,000,000 scale) can be used for appropriate maps at statewide or regional scale.

3.2 COMPILE THE ROAD NETWORK

Ideally, road network data will be compiled to create a seamless statewide network to store road and event data. The network data acquired from sources outside ADOT&PF will be appended to the Enterprise GDB centerline network, which serves as the backbone network data. Using conflation[1] procedures, the non-ADOT&PF network data can be stitched to the Enterprise GDB centerlines to make a seamless network. Statewide comprehensive road network stitching is not within the scope of this project. The project team identified and prioritized the extent of road line data that will be stitched to the ADOT&PF centerline network.

Road network data will be compiled in a manner that ensures the various data sets are projected correctly and data can be overlayed appropriately. Also, the key attribute fields in the Links layer (such as road name, GroupID and Data Source) will be populated so that data can be merged together with shared attributed fields. The project team will once again review the road network on a community by community basis and conduct QA/QC.

3.3 ESTABLISH THE CDS CORRESPONDENCE

Each road in GroupID 2 that comes from a source outside ADOT&PF will need to be matched with its corresponding CDS route in HAS. For many of these roads, HAS has features (e.g., intersecting roads) that can be referenced to the road network data. The first step in matching roads with their corresponding HAS CDS route will be matching road names. GIS scripting will be used to do the initial matching (such as the "like" function in the GIS query, the wildcard query, or fuzzy logic). It will not be a trivial process to match all the road names. The level of effort is highly dependent on the data quality. If the centerlines carry complete road name information necessary for constructing the CDS names in HAS, it will then be possible to programmatically match up the majority of the data records. CDS routes that cannot be automatically matched will have to be manually matched. The second step in matching roads with their corresponding HAS CDS routes will be matching where the routes begin and end. Some CDS routes may not cover the full extent of a road, or they may include more than one road. Therefore, it will require someone to manually look at every road to match the route coverage.

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[1] Conflation is a set of functions and procedures to align the line features of one feature class with those of another and then transfer the attributes

3.4 BUILD CDS ROUTES

Once the road names are matched using the automatic/manual matching process, the next step is to build CDS routes. In ArcGIS, the geometric length of network features will be set to be the default built-in measures, and the digitizing direction of the network features will be assumed as the measure increasing direction of the route. Route measures can be reversed if this assumption is proved to be wrong.

3.5 COMPARE ROUTE MEASURES

For the newly built routes, the HAS length and the centerline length will be compared. If the measure difference is above a certain threshold, the newly built route will require a closer look. A list of the CDS routes with large measure discrepancies will be sent to ADOT&PF for review. If the HAS measures are considered correct, the project team will then check the centerline data quality and check for judgment errors when determining the beginning and ending of the route.

3.6 CALIBRATE ROUTE MEASURES

Measure calibrations can help to improve the locational accuracy of the FClass GDB event data. However, systemwide network calibration is beyond the scope of this project. The focus of this project is to ensure that when a road's functional classification changes, it displays correctly relative to the reference network. Therefore only CDS routes with more than one functional classification will be calibrated so that the breakpoints of the functional classification events will have locational accuracy.

All network data in GroupID 2 excluding Enterprise GDB roads that are not stretched need to be calibrated at functional classification break points. The preliminary estimate is that HAS has approximately 400 non-ADOT&PF roads classified as collector or arterial that fall in GroupID 2. Of these, there are approximately 15 roads that have a functional classification change along the length of the road. In addition, there are approximately 500 ADOT&PF roads classified as collector or arterial that may be in GroupID 2 (approximately 100 of these are airport access roads). It is anticipated that there will be relatively few of these that have a functional classification change along the length of the road. Given that most CDS routes will have only one functional classification, it will minimize the extent of the calibration effort.

The first step of the calibration process is to review the HDP route list and find out how many different functional classifications there are for each CDS route:

- If a route has only one functional classification, assign the same functional classification value to all network links for the selected CDS route. No additional calibration is needed.

- If a route has more than one functional classification, then we need to determine where the functional classification changes. In order to correctly map the breakpoints, the milepoint measures derived from geometric length need to be matched up with HAS measures which calls for network calibrations.

For all routes, the total length of any route will be calibrated against the route length measure obtained from HAS. Features with known measures from both the network and HAS will be used to perform network calibration. With measures available in HAS, intersections can be physically identified on the network. Therefore it is recommended to use intersections as the anchor points for calibration following these procedures:

1. From the HDP route list, identify roads that have more than one functional classification; on these roads, identify the intersections and their measures where functional class changes.
2. Linearly reference these identified intersections to the reference network and create an intersection event layer.
3. Create a Nodes Layer from the Links layer using ArcGIS.
4. For each linearly referenced intersection in the intersection event layer, find the nearest intersection on the Nodes layer. Please note that the nearest point is not always the right match for the anchor intersection; in that case, some mechanism needs be provided for user to point to the right match based on best judgment.
5. Calibrate the CDS route measures using the measure differences for the anchor intersections. Local calibration will be conducted, that is, only the measures for road links between one anchor intersection and another will be calibrated using the measure differences of these two points.
6. After calibration, the FClass GDB event data can then be mapped to the calibrated CDS routes.

Calibration can later be expanded to include more calibrating points with known measures such as additional intersections or other features such as bridges. For those CDS routes without any distinct features that can be used for calibration, the ending measure of each route can be set to be the same as the HAS measured length for the corresponding route, which will ensure that the events can be mapped onto the network without overshooting or undershooting problems.

Calibration can later be expanded to all GroupID 2 roads so that more event data can be mapped to the reference network.

There are several important issues that need to be kept in mind regarding the calibration process and the accuracy of the reference network and event data:

1. The digitizing direction for a CDS route may not be the same as what is defined in HAS, in which case the FClass event data may not be mapped appropriately. The intersection locations must be reviewed to determine if measures on the CDS route will need to be reversed.

2. The post-calibration accuracy of the measures is highly dependent on the quality of the data source. After performing calibration on functional classification breakpoints, the results should be examined and evaluated before planning for additional calibration efforts.
3. Due to the limited extent of network stitching and route calibration being performed at this time, the absolute location of road network data and of events mapped to the road network will not have a high degree of accuracy. It would be appropriate to add a disclaimer to the final FClass GDB product stating the limitations of the road network, including that point and line event data may not necessarily display correctly relative to the road network.
4. One of the assumptions built into the FClass GDB is that the "true" measures are the linear CDS Route milepoint measures obtained from HAS. As described above, the absolute location of the reference network and of events mapped to the road network will not have a high degree of accuracy. However, the event milepoint values and event locations relative to each other should be accurate. Therefore, the FClass GDB users should be encouraged to rely on the event data (e.g., cross streets) and their milepoint values for locational accuracy and not the road network.

3.7 Map the Data

The event tables will be linearly referenced on to the reference network for GroupID 1 & 2 roads of the reference network. The event layers will be converted to feature classes before distributing to the End Users. Various products will be produced following the development of the FClass GDB. Design of templates and map books to organize various regional products will be documented in a separate design document.

Appendix A: Data Sources

Data Source	Geographic area	Quality	Currentness
ADOT EGDB	ADOT Enterprise GDB	Very high	Current
ADOT Other	Other GPS Data collected by ADOT	Uncertain	Uncertain
ADNR	Statewide roads based on USGS 1:63360 scale.	Topo map quality	Varies, but generally 1992 is most current.
Municipalities	Anchorage	High	Current
Boroughs	Kenai PB, CBJuneau, Fairbanks	Moderate to High	Current
Cities	Sitka, Valdez, Cordova, Ketchikan	Moderate to High, with some exceptions (Sitka is excellent)	Current
DCCED Profiles -- Towns/Communities	Various (20+)	High (for data post 2001)	2001 to present
TIGER (from K.Lizik)	Statewide—small communities, e.g. North Slope, some southeast.	Fair to Moderate	Varies, but generally current
BIA	BIA managed roads in rural areas	Sporadic. BIA has not developed a GIS road network at this time.	Variable
USFS	Southeast Alaska	High resolution; mostly for timber access areas.	Current.

Appendix B: Data Elements and Fields

B.1 Fields for Point Event

Field Name	Field Type	Field Size	Allow Null	Default Value	Description	Domain
Feature (System Features/Cross Streets, RR Crossings, Mileposts, Bridges/Culverts, and Buildings/Landmarks)						
Pointtype	Integer			1	Point Event Type	
Featr_Type	String		No		Feature Category Type	Featr_Type
Featr_Ptype	String		No		Feature PTYPE	Featr_Ptype
Featr_Pcode	String		No		Feature PCODE	
Side	String				Side of Road	Side
Featr_Desc	String				Feature Description	
Coll_Date	Date				Collection Date	
Coll_Source	String				Collection Source	Coll_Source

B.2 Fields for Line Event

Field Name	Field Type	Field Size	Allow Null	Default Value	Description	Domain
NationalHighwaySystem (National Highway System)						
Linetype	Integer			1	Line Type	
NhsSys	String		No		National Highway System	NhsSys
AlaskaHighwaySystem (Alaska Highway System)						
Linetype	Integer			2	Line Type	
AhsSys	String		No		Alaska Highway System	AhsSys
MaintenanceResponsibility (Maintenance Responsibility/Ownership)						
Linetype	Integer			3	Line Type	
MnResp	String		No		Maintenance Responsibility/Ownership	MnResp
FunctionalClassification (Functional Classifiation)						
Linetype	Integer			4	Line Type	

Field Name	Field Type	Field Size	Allow Null	Default Value	Description	Domain
FClass	String		No		Functional Classification	FClass
RoadSurface (Road Surface)						
Linetype	Integer			5	Line Type	
RdSurf	String		No		Road Surface	RdSurf
Coll_Date	Date				Collection Date	
Coll_Source	String				Collection Source	Coll_Source
TrafficLinks (Traffic Links)						
Linetype	Integer			6	Line Type	
TrafLink_Id	String		No		Traffic Link ID	
TrafLink_AADT	Integer				Traffic Link AADT	
AADT_Year	String		No		AADT Year	
HpmsLinks (HPMS Links)						
Linetype	Integer			7	Line Type	
HpmsLink_Id	String		No		HPMS Link ID	
Hpms_Type	String				HPMS Link Type	Hpms_Type
NumberOfLanes (Number of Through Lanes)						
Linetype	Integer			8	Line Type	
Num_Lanes	Integer				Number of Through Lanes	
Coll_Date	Date				Collection Date	
Coll_Source	String				Collection Source	Coll_Source
TrafficDirection (Traffic Direction – One or Two Way)						
Linetype	Integer			9	Line Type	
Traf_Dir	String				Traffic Direction (One or Two Way)	Traf_Dir
Coll_Date	Date				Collection Date	
Coll_Source	String				Collection Source	Coll_Source
NetworkCollInfo (Centerline Network Collection Date)						
Linetype	Integer			10	Line Type	

Coll_Date	Date			Collection Date	
Coll_Source	String			Collection Source	Coll_Source
DOTRegion (ADOT&PF Region)					
Linetype	Integer		11	Line Type	
Region_Desc	String	No		Region Description	Region_Desc
CensusArea (Census Area)					
Linetype	Integer		12	Line Type	
Census_Desc	String	No		Census Description	Census_Desc
Borough (Borough)					
Linetype	Integer		13	Line Type	
Borough_Desc	String	No		Borough Description	Borough_Desc
UrbanRural (Urban/Rural Designation)					
Linetype	Integer		14	Line Type	
UrbanRural_Desc	String	No		Urban/Rural Designation	UrbanRural_Desc

B.3 Background Features

Field Name	Field Type	Field Size	Allow Null	Default Value	Description	Domain
StateGen (generalized coastline)						
Polygontype	Integer			1	Polygon type	
StateGen_Id	Integer				StateGen Id	
State250000 (1:250,000 scale coastline)						
Polygontype	Integer			2	Polygon type	
State250000_Id	Integer				State250000 Id	
State63360 (1:63,360 coastline, was named State under Jurisdictional Boundaries)						
Polygontype	Integer			5-	Polygon type	
State63360_Id	Integer				State63360 Id	
Lakes1mil (1:1,000,000 lakes)						
Polygontype	Integer			3	Polygon type	
Lake1mil_Id	Integer				Lakes1mil Id	
Lakes2mil (1:2,000,000 lakes)						
Polygontype	Integer			4	Polygon type	
Lake2mil_Id	Integer				Lakes2mil Id	
Rivers1mil (1:1,000,000 rivers)						
River1mil_Id	Integer			2	Lakes1mil Id	
DnIntype	Integer				River type designation	
Rivers2mil (1:2,000,000 rivers)						
River2mil_Id	Integer			1	Lakes2mil Id	
Airports (airports from ADOT Statewide Aviation database)						
Pointtype	Integer			2		
Airport_Id	Integer				Airport Id	
Airport_Name	String	50			Airport Name	
AirportFacility_Owner	String	25			Facility Owner	
Owner	String				Owner	
Date_f	Date				Effective date	
Date_t	Date				Termination date	
Date_u	Date				Update date	
Ports						
Pointtype	Integer					
Port_Id	Integer				Port Id	
Port_Name	String	50			Port Name	
PortFacility_Owner	String	25			Port Facility Owner	

Field Name	Field Type	Field Size	Allow Null	Default Value	Description	Domain
Owner	String				Owner	
Date_f	Date				Effective date	
Date_t	Date				Termination date	
Date_u	Date				Update date	
Community (Named Place Feature Points from DCED, USGS, and Tourism)						
Pointtype	Integer			1		
Community_Id	Integer				Community Id	
Community_Name	String				Community Name	
Community_Type	String				Type of political organization	Community_Type
Owner	String				Owner	
Date_f	Date				Effective date	
Date_t	Date				Termination date	
Date_u	Date				Update date	
MPOboundary (MPO Boundary)						
Polygontype	Integer				Polygon type	
MPO_Id	Integer				MPO ID	
MPO_Desc	String				MPO description	